4.

TEN YEARS' PRACTICAL EXPERIENCE
IN
SEWAGE TREATMENT;

A CONTRIBUTION TO THE CONFERENCE
HELD AT
THE SOCIETY OF ARTS,
ON THE 15TH AND 16TH OF MAY, 1879,

BY FRITZ HILLE, C.E.

The Sewage question stands now as it stood twelve months ago, when the Conference of the Society of Arts was held in May, 1878; no progress, no further discovery has since been made in the treatment, utilization, and in the disposal of Town Sewage, and, having no further remarks to add to those contained in the pamphlets written by me on this subject, I now submit, as a possible matter of interest to those concerned in or connected with the Sewage question, the results obtained during the last ten years from practical every-day use of the method of Sewage disposal advocated by me. I shall refer to Towns where my system of Sewage treatment has undergone the test of time; giving analyses, correct statements of cost for labour and chemicals, and other figures and testimonials which show and prove unquestionable success.

WIMBLEDON.

The analyses and letters underneath refer to results obtained at the Wimbledon Sewage Works during the time from the beginning of 1870 to the end of 1876.

Surveyor's Office, Wimbledon,
January 31*st*, 1872.

SYSTEM—F. HILLE.

Dear Sir,

I have much pleasure in bearing my testimony to the great efficiency of your system of dealing with the Sewage of Towns, and from the experience I have had in the practical working of the process during the last eighteen months at Wimbledon, based upon a twenty years' experience of the subject, and the full acquaintance of all existing means of purifying Sewage, I am convinced that your process is the cheapest and most effective of all.

I take this opportunity of saying that the Samples of Sewage referred to in the analyses of Dr. Letheby, dated respectively September 20th, 1871, and 9th November, 1871, where taken in my presence and upon the days mentioned.

I am, dear Sir,
Yours faithfully,

To F. Hille, Esq. W. F. ROWELL.

Report *of an Examination of Samples of Wimbledon Sewage, before and after treatment with the Disinfecting Compound, specified in* Mr. Hille's *Patent.*

The Samples were sent to Laboratory by Mr. Hille on the 20th of August, and the 5th of September, and they were labelled as follows :—

August 20th ...	Sewage taken on the 20th of August, 1871, at 1 p.m. Effluent Water taken at the same time.
September 5th	Sewage taken on 5th September, 1871, at 2.30 p.m., in the presence of the Surveyor of Wimbledon. Effluent Water taken at the same time.

The Sewage in both cases was black and turbid, and was extremely offensive, envolving abundance of sulphuretted hydrogen and other gases; but the Samples of Effluent Water were clear and free from offensive odour.

The amount of oxygen required for the oxydation of organic and other matter in solution, in the Sewage and Effluent Water, were as follows :—

August 20th ...	Sewage	2·338	Grains per Gallon.
	Effluent Water	0·306	,, ,,
September 5th	Sewage	4·870	,, ,,
	Effluent Water	0·315	,, ,,

The Soluble and Suspended Matter in the several Samples were as follows :—

Constituents per Imperial Gallon.	Sept. 5th, 1871, at 2.30 p.m.		August 20th, 1871, at 1 p.m.	
	Original Sewage.	Effluent Water.	Original Sewage.	Effluent Water.
	Gr.	Gr.	Gr.	Gr.
Soluble Matters	58 00	25·43	116·47	33·27
Of which Ammonia	5·37	1·27	14·99	2·56
,, ,, Organic do. ...	0·34	0 08	0·08	0·09
,, Nitrogen as Nitrates ...	0 00	0·03	0·00	0·04
,, Chlorine as Chlorides ...	9 49	7·10	10·76	8.35
,, Organic Matter, etc. ...	14·65	2.45	20·80	2.61
,, Mineral do. ...	43·35	22.99	95·67	30.66
Suspended Matters	213·76	0·00	1261·04	0 00
Of which Organic Matter ...	75·03	0·00	705·71	0·00
,, ,, Mineral do. ...	138·73	0·00	555.33	0.00

These results show that the defaecation of the Sewage has been very complete, and that the Effluent Water is sufficiently pure to be admissable into any running stream without causing the slightest offence.

(Signed) HY. LETHEBY, M.B., M.A., etc.

Professor of Chemistry in the College of the London Hospital and Medical Officer of Health for the City of London.

College Laboratory,
London Hospital,
September 24th, 1871.

13a, Great George Street,
July 7th, 1872.

Dear Mr. Hille,

I have recently made some experiments with your Precipitating and Disinfecting Materials, which seem to me to place their value in a clearer light. At all events if you have not made the same experiments they may be of interest to you.

I take Sewage and add to it a small quantity of a clear Solution of your Chloride of Magnesium, I then add some clear Lime water and stir the mixture well. The action which takes place is as follows :—the Lime water decomposes the Chloride of Magnesium, and produces a bulky precipitate which quickly subsides, carrying down with it *all the suspended matters* in the Sewage, and leaving a clear supernatant liquor. The subsidence is very rapid, quite as rapid as with the use of Phosphate of Alumina or Phosphate of Lime, the *modus operandi* in all these cases being the same.

At the same time the supernatant liquor is almost entirely deprived of smell, EVERY TRACE OF WHICH WOULD BE REMOVED BY YOUR FILTERS.

Before I made these experiments I had a doubt as to the use of Chloride of Magnesium, and considered that the action was due to Lime alone. But making the experiment in the way I have described, shows clearly the value, I ought perhaps to have said the importance, of the Chloride as an ingredient, for I have proved that LIME ALONE produces never so rapid and complete a precipitation, the reason for which is now clear.

There can be little doubt that in the action I have mentioned with Sewage, all the Phosphoric Acid will be taken from the Alkaline Phosphates and go down with Lime or Magnesia, but this I have not proved.

Yours very truly,
W. F. FEWTRELL.

F. HILLE, Esq.

SURVEYOR'S OFFICE.
WIMBLEDON LOCAL BOARD,
WIMBLEDON, S.W., 17*th October*, 1874.

To F. HILLE, Esq., C.E.

DEAR SIR,

In answer to yours of yesterday, I have much pleasure in stating that your process has been in constant operation at our temporary Sewage Works for the last 4½ years.

The effluent water has been discharged from the works sufficiently pure for all practical purposes, and the sludge deposit was free from all objectionable smells, even in the hottest weather.

I consider that your mode of purifying Sewage fulfils all sanitary requirements, and is at the same time the cheapest chemical system in use.

I am, dear Sir,
Yours faithfully,
(Signed) WM. F. ROWELL,
Surveyor to the Local Board.

CHISWICK, W.

The Wimbledon Local Board from 1870 to 1876, were entirely free from litigation in respect of the disposal of their Sewage, there were no complaints, and my method of treating the Sewage gave satisfaction to the authorities.

EDMONTON.

The official documents underneath as to efficiency, and the figures as regards cost, speak for themselves.

Lee Conservancy,
London, E.C.
14th December, 1875.

EDMONTON SEWAGE.

Sir,

In answer to your letter of the 7th instant on this subject, I am directed by the Lee Conservancy Board to reply that they note with satisfaction the efforts which have lately been made by the Edmonton Local Board of Health with a view to comply with the requirements of the Lee Conservancy Act, in respect of the purification of the Sewage of Edmonton, which formerly passed into the streams leading to the river Lee, and which was recently the cause of so much litigation between themselves and your Board.

From analysis, the Conservators have for the moment no fault to find with the present state of affairs, and they trust there will not be a return to a former condition of things. The absence of censure must be taken as the only expression of satisfaction my Board, in their peculiar position, are able to convey.

I am, Sir,
Yours faithfully,
(Signed) G. CORBLE,
Clerk.

C. S. Houlder, Esq.,
Clerk to the
Local Board of Health, Edmonton.

EDMONTON LOCAL BOARD OF HEALTH.

Charles S. Houlder, Solicitor, Clerk.

Edmonton,
December 6th, 1876.

Dear Sir,

I am directed by the Edmonton Local Board to reply to your favor of the 30th ultimo, that they have pleasure in informing you that they acknowledge the satisfactory results of your process now in use at the Edmonton Sewage Farm.

Your process has satisfied the requirements of the River Lee Conservancy Board, and it appears to the Edmonton Board to be at present the best known process.

Faithfully yours,
(Signed) CHAS. S. HOULDER,
Clerk.

F. Hille, Esq.,
Chiswick, W.

The Edmonton works serve as a model for places similarly situated. The effluent water gives satisfaction to the local and to the river authorities, and the sludge has proved no difficulty: the stuff is inoffensive, and as a good manure finds ready customers. The osier beds answer very well.

The System has stood the test of time and of practical every day use very well indeed.

The annual cost at Edmonton for a population of 16,000 is for chemicals :—

Lime—3 yards per week,	at 13s. 6d.	£2	0	6	
Salts— 5 cwt. 1 qr. ,,	at 8s. 6d.	2	4	7	
Tar—9 gallons ,,	at 0s. 5d.	0	3	9	
		£4	8	10	*per week.*

Weekly Wages and Materials :

Engine Driver ...	£1	15	0
Assistant	1	1	0
Boy	0	6	0
Incidentals	0	2	6
Six tons of coal ...	5	14	0
One Gallon Oil ...	0	5	0
Wear and Tear ...	0	10	0
	£9	13	6

£9 13 6 ⅌ week, or ⅌ ann. about £750
Royalty 100
£850

or, cost for chemicals and royalty, about £350—equal to 5¼d. per head of the population;

or, total cost of works ... ... about £850—equal to 1/1 per head of the population.

In the beginning of 1878 some eight acres of land were laid out and prepared for watercress beds, to be supplied with the purified effluent from the deposit tanks, and the operation of growing watercress with such water has proved quite a success, so much, that double the quantity of land will be used this year for the same purpose. This land lets at £10 per acre.

A description of the Edmonton Sewage Works is given in my "Remarks on the Sewage Question," of 1877.

TOTTENHAM.

I have treated the Sewage of this town for more than three years, and the following letters refer to the result, *i.e.*—

Asplins, Tottenham,
November 6th, 1877.

Dear Sir,

Having used on my Farm a considerable quantity of manure obtained from the Works of the Tottenham Local Board, I can now give the results. I find it exceedingly beneficial in the production of cabbages, imparting that good color almost unobtainable from other manures. Tares and rye thrive remarkably well, as also do white turnips. My experience with meadow land last season was of a limited character, but I was so far satisfied that I have lately well manured upwards of 30 acres of grass land, which will enable me, later on, to speak from facts.

As a general rule I do not take any notice of written testimonials, knowing them to be mere advertisements, however, in this case most of the crops are to be seen, and they will speak for themselves.

Yours truly,
(Signed) WM. B. DELANO.

W. A. H. de Pape, Esq.

Tottenham,
3rd June, 1878.

F. Hille, Esq..

Dear Sir,

I have much pleasure in bearing my testimony to the success which has attended your treatment of the Sewage of this district ever since its commencement in the month of February, 1876.

We have since that time had no complaint from the River Lea Conservancy authorities as to the quality of the effluent water we discharge into their river.

We have for some time past had no difficulty in getting rid of the sewage deposit (sludge) which is being used as a manure; and the Sewage Works have entirely ceased to be complained of as a nuisance by those inhabiting the neighbourhood in which they are placed.

Wishing you the same success in other districts where your system may be applied,

I have the honour to remain
Your obedient servant,
(Signed) ARTHUR R. ABBOTT,
Chairman to the Tottenham Local Board of Health.

The cost of chemicals used from the 17th of February, 1876, to the 17th of February, 1877, for treating daily from one million and a half to two million gallons of notoriously bad Sewage, amounted to

For 353 cubic yards of Lime at 13/6 per cubic yard	£238	5	6
For about 1,000 gallons of Tar	25	0	0
For Chemical Salts	208	0	0
	£471	5	6

SOUTHBOROUGH.

The analysis and letter underneath speak for the results obtained at Southborough.

South London Central Laboratory,
Kennington Cross, London, S.E.
13*th February*, 1877.

Analysis of a sample of water received from Southborough Local Board, by G. Delves, Esq., on the 9th February, 1877.

Residue	16·10	grains per gallon.
Chlorine	2·85	
Total hardness . . .	6·40	
Permanent Hardness . .	6·40	
Free ammonia . . .	4·00	parts per million.
Albuminoid ammonia . .	0·67	

Remarks.

Considered as an effluent water this sample is sufficiently pure to be turned into a running stream.

(Signed) JOHN MUTER,
Public Analyst for Lambeth, &c.
W. BAXTER, *Secretary.*

[Copy.]

Southborough Local Board,
8*th August*, 1878.

Dear Sir,

In reply to your letter of the 7th ult., I am instructed to inform you that for some years past the Southborough Local Board have experienced great difficulty in the treatment of the Sewage of their district, so as to prevent any nuisance to the stream into which the effluent water runs, and have tried numerous systems of purification, all of which turned out more or less failures.

It was not (as you are aware) until after the Board had decided upon purchasing land for a Sewage farm that your process was adopted at Southborough, and the Board consider that, although the existing tanks are very inefficient for the proper carrying out of your system, such process is decidedly the best of those the Board have tried, particularly as regards the quality of the effluent. The Board are also of opinion that the cost of the process is reasonably cheap, and believe that in many instances (particularly where suitable land cannot be obtained) Sanitary Authorities would do well in adopting your patent system for purification of sewage.

I am, dear Sir,
Yours truly,
(Signed) GEORGE DELVES.
Clerk to the Southborough Local Board.

F. Hille, Esq., *Engineer.*
Chiswick, W.

TAUNTON.

After the Taunton Sewage Works had been three months in operation, on the 28th of December, 1877, at a special meeting of the town council to consider, and, after careful inspection and thorough investigation, to report upon the efficiency of the works, and upon the results obtained from the use of my process for the treatment of the Sewage, the following resolution moved by the mayor was passed :—

"*That the Taunton Sewage Outfall Works have fulfilled the expectations of their promoters and the requirements of the town.*"

LEICESTER.

The following letters refer to the results obtained at the Leicester Sewage Works :—

"Leicester,
"*October* 16*th*, 1877.

"We have applied Mr. F. Hille's patent process for the purification of the effluent water from our sewage works for the months of May to September, both included. Considering the filthy condition of the banks and bed of the river, the fouling of years past, the very limited area of settling tanks, and the small lengths of weirs in proportion to the large volume of sewage passing the works, viz., 6,000,000 gallons per diem, the water in the river was greatly improved by the application of the process.

" The occupiers of land immediately adjacent to the works, and the occupiers of the Belgrave Lock House, which is surrounded by the effluent water, declare the beneficial effects on the atmosphere which they all state has not been so free from pollution for 20 years.

" The action of the salts is so effective in cleansing the covered tanks that the labourers employed in emptying them give the process the highest praise as enabling them to do their work without nuisance. I have no hesitation in saying that I believe under more favourable circumstances the effect would be perfect.

" (Signed) E. L. STEPHENS,
" Borough Surveyor."

(COPY.)

" THE NURSERIES,
" LEICESTER ABBEY,
22*nd June*, 1877.

" My dear Sir,

" I have been much struck with the beneficial effects of Mr. HILLE's process on the river water adjoining my meadow. I have watched the river daily, and have no hesitation in saying that I have never seen the water during the last 20 years so free from all smell and offence.

" I am, dear Sir,
" Yours truly,

" (Signed) THOMAS WARNER.

" E. L. STEPHENS, Esq.,
" Borough Surveyor,
" Leicester."

As to cost, the figures underneath speak for themselves :—

Cost of Chemicals, Fees, and Travelling Expenses :

1877.	HILLE'S PROCESS.			£	s.	d.
May.	Total cost for Lime, Tar, Salts, Fees & Expenses...			187	9	2
June.	Do.	do.	do. ...	164	18	5
July.	Do.	do.	do. ...	158	18	3
August.	Do.	do.	do. ...	130	0	11
September.	Do.	do.	do. ...	135	13	2
			Total...	£776	19	11

The figures given above, show that the total expenditure for chemicals during the five summer months amounted to £776 19s. 11d., or on the average £156 per month, including travelling expenses ; according to this the annual expenditure would be about £1,872 ; but a considerable part of that amount could be saved by a judicious arrangement of summer and winter treatment. The yearly outlay of £1,872 for 120,000 inhabitants represents not quite fourpence pro head of the population.

It will be seen, when comparing the cost at Leicester with other towns, that the expense for the chemical treatment of large volumes of Sewage according to my plan, is not greater, but rather smaller, in proportion to moderate quantities, for instance :

		Inhabitants,			Per ann.			
Leicester,	with	120,000	at the	cost	£1872	equals	4d.	pro head of population.
Tottenham	,,	34,000	,,	,,	575	,,	4d.	
Edmonton	,,	16,000	,,	,,	350	,,	5¼d.	
Taunton	,,	16,000	,,	,,	300	,,	4½d.	
Southboro'	,,	4,000	,,	,,	100	,,	6d.	

ALDERSHOT.

Reference has been made in my Pamphlets to the Aldershot (Town) Sewage Works, which were completed in December, 1877. Since then I have treated the Aldershot Sewage, and I am able to state that the Sewage Works and the plan carried out give satisfaction to the authorities. The total cost of these works, which are large enough to deal with the Sewage of 15,000 people, is under £3,000, inclusive of about three acres of land, and comprising, inlet chamber with gratings and screens, valves and storm-overflow, pumping well and reservoir, three deposit tanks provided with syphons and overflow, pumps for lifting sludge and cleaning tanks, sludge beds, two engines with pumps, boilers, and all completements for lifting the sewage, and all mixing apparatus, and pump for pure water supply.

These Works serve well as model for towns similarly situated, and they practically show that and how a great deal can be done with the expenditure of comparatively little money.

WINDSOR.

The Windsor Sewage Works were designed by Messrs. Thos. & Chas. Hawksley, and have been carried out in substantial and costly style ; they well deserve a visit of inspection, as theyshow like all Messrs. Hawksley's works perfection in every detail. The Sewage is carried from Windsor by means of an intercepting sewer, 4ft. 6in. in diameter, and about 3 miles in length, to the pumping well at the Outfall Works, and this sewer serves for all practical purposes as storm reservoir at the same time. From the pumping well Sewage and chemicals mixed together are lifted and delivered into three deposit tanks, and from these the effluent is either discharged through an outfall chamber into the river, or it is turned upon filtering beds and finds its way thus into the Thames.

The effluent at Windsor is of a very fair quality, and there is no difficulty in disposing of the sludge, the whole of which is used on the land as manure. The Windsor Sewage has been treated by me since the Works were opened in October last, and they answer well the purpose for which they were intended.

The Sewage Works at Birkdale and Somerton will soon be finished, and there are several large towns which have definitely adopted my plans for outfall works, and my method of Sewage disposal. Of those places I intend to give an account at some future occasion.